Modem E1

Features

- E1 G703/G704 channel
- Distance up to 1.5 km
- V.35/RS-530/RS-449/RS-232/X.21/ Ethernet user data interface
- Data rate from 64 kbps up to 2048 kbps
- Programmable timeslot assignment
- G.703 2048 kbps unframed mode
- Cronyx PCM2 compatibility
- CAS and CRC4 framing
- Synchronization from digital interface (DTE emulation)
- Digital, local and remote loopbacks
- Integrated BER tester
- RS-232 Control port
- Dry contacts alarm interface
- Stand-alone or rack-mount (19''3U)
- AC or DC power
- The certificate No. ОС/1-СПД-19 ССЭ of the Russian Ministry of Communications (registration number РОСС RU.0001.01ЭС00)

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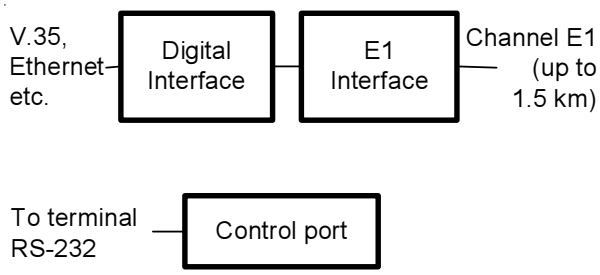
Description

Cronyx - E1-L is a multipurpose access unit for Fractional E1 services. As a rate and interface converter it accepts digital interface data at any multiple rate of 64 kbps up to 2048 kbps and places it into E1 frame using required number of timeslots or the whole bandwidth of 2048 kbps in unframed mode.

As a modem it is capable to operate at distances up to 1.5 km over twisted pair or coaxial cable.

E1-L device is available as stand-alone unit or as a card for 19" 3U Cronyx rack. Rack mount modem consists of two cards one of which is set on the front side and the other on the back side of the rack.



It can be ordered with RS-530, RS-232, V.35 or X.21 interfaces, ended with standard connectors. Multi-standard interface option with HDB44 connector is also available. The type of interface in this case is determined by adapter cable: RS-232, RS-530, RS-449, RS-442, V.35 or X.21.

Device can be ordered with Ethernet interface. A couple of devices with this interface form a remote bridge for two LANs.

Configuration can be performed via RS-232 control port or by DIP switches. Configuration parameters are stored in NVRAM.

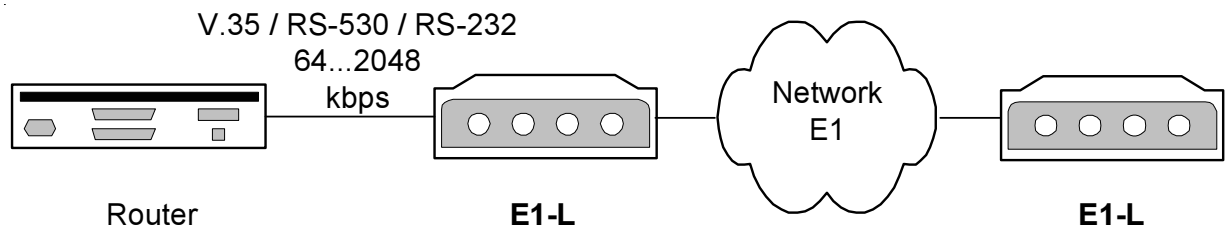
Maintenance capabilities include user activated local and remote loopbacks on the E1 link. In-band management of the remote unit can be performed by using the spare bits (Sa) on timeslot 0 (in compliance with G.704 recommendation).

Modem E1-L is also available as a card for Intel-compatible computers (Cronyx-Tau/E1, Cronyx Tau-PCI/E1).

Package Contents

The following is a check list for the contents of your package:

- Modem E1-L in ordered configuration
- Removable terminal block for E1 line
- Power supply cord (for AC power models)
- User manual



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Specifications

Digital Interface

Data Transfer Rate	N x 64 kbps or up to 2048 kbps in unframed mode
Clock Options	TXC, RXC, ETC, ERC
ModemControl Signals	DTR, DSR, CTS, RTS, CD

E1 Interface

Line Coding	HDB3
Line Impedance	120 Ohm Balanced (Twisted Pair) or 75 Ohm Unbalanced (Coax Cable)
Input Signal Attenuation Range	from 0 to –30 dB, up to 1.5 km of 22 AWG (0.6 mm) twisted pair
Transmit Timing Sources	INT (Internal Oscillator) RCV (Receiver) EXT (Digital Interface)
Jitter Attenuator	Both in receive & transmit path, 120 UIpp attenuation
Frame structure	G.704 or unframed mode
Multiframes	CRC4, CAS(G.704)
Frequencies offset Adjustment	Controlled Slip Buffer
Connector Type	Terminal Block

Alarm Interface

Relay Contact Current	up to 250mA
Relay Contact Voltage	up to 175V DC

Control Port

Interface	RS-232
Protocol	Async 19200 bps, 8 bit/char , 1 stop bit, no parity
Connector Type	DB9

Diagnostics

Loopbacks	Digital, local (G.703 line on local unit), remote (G.703 line on remote unit), selected by front panel switches or via control port
BER Tester	Activated by front panel switch or via control port

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Ordering Code

E1-L / B-M-AC

- **Power supply:**
  - AC – ~220V,
  - DC – =60V (for stand-alone unit only)
- **Digital interface:**
  - M – multistandard
  - V35 – V.35
  - 232 – RS-232
  - 530 – RS-530
  - ETH – Ethernet
- **Construction:**
  - B – stand-alone unit
  - R – Rack mount card
- **Model:**
  - E1-L – modem E1

Controls and Indicators

Controls on front panel

BERT – bit error rate tester switch:

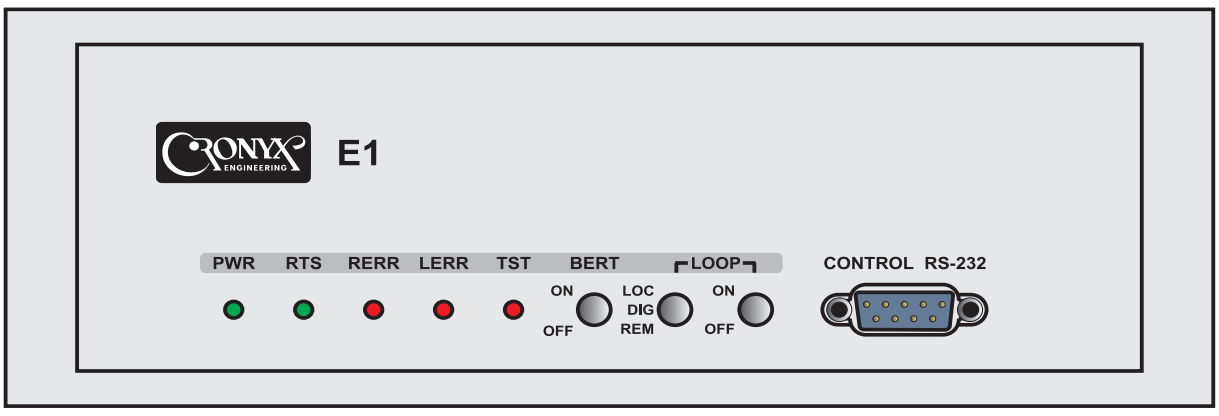
BERT	BER tester switch
ON	E1 line testing
OFF	normal operation

LOOP – two loopback mode switches:

Loopback	LOOP1	LOOP2
Disable	OFF	Any
Local loop on link E1	ON	LOC
Remote loop on link E1	ON	REM
Digital loop	ON	DIG

Front panel indicators

Indicator	Description
PWR	Power supply
RTS	Digital interface signal (Ready to Send)
RERR	Remote unit errors
LERR	Local unit errors
TST	Test modes



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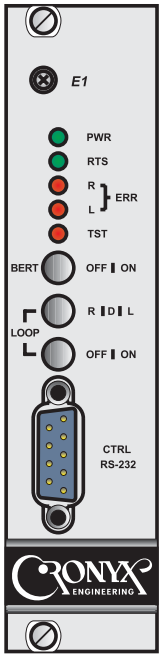
TST indicator:

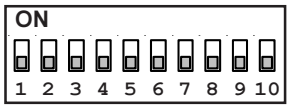
State	Description
Off	Normal operation
Lights	BER tester is ON
Continuous Blinks	Local loop is ON
Single blinks	Remote loop is ON
Double blinks	Digital loop is ON

LERR indicator lights if there is no signal on E1 line, if external clock frequency doesn't correspond with the selected data transfer rate, if synchronization is lost in framed operation mode. If BER test mode is ON, LERR indicator lights if there are errors in E1 line.



RERR indicator lights if synchronization is lost on remote unit (bit A of timeslot 0). RERR indicator is not used in unframed operation mode.

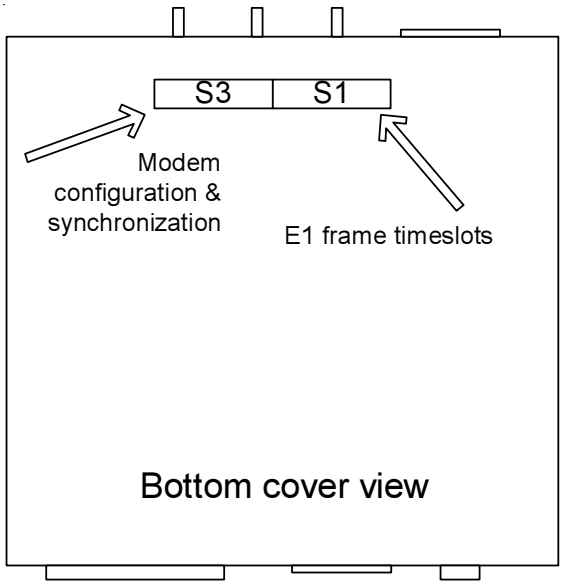
DIP switches



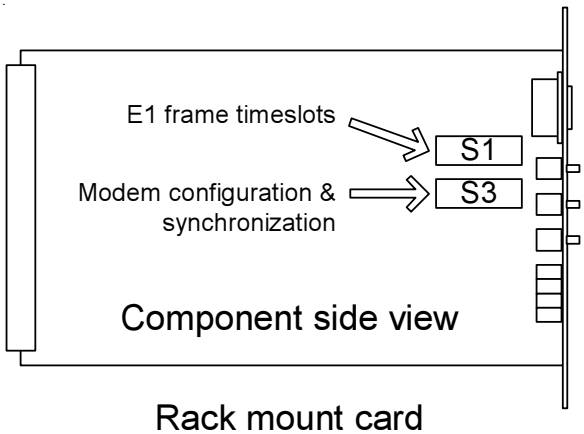
DIP switches are placed on bottom cover of stand-alone unit and on component side of card in rack mount unit.

S1 group — E1 frame timeslots or data transfer rate on digital port in unframed operation mode.

S3 group — Modem configuration & synchronization.



Stand-alone unit



Rack mount card

The following designations are used for DIP switch state indication:

	OFF
	ON

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Configuration Saving

S3-9 switch enables remote control of modem: parameters are set by terminal connected to control port or by network via SNMP protocol (rack mount unit).

In remote control mode parameters are stored in NVRAM. If remote control is disabled NVRAM is not used and parameters are set only by DIP switches.

S3-9	Parameters setting
	By switches only, remote control is disabled, NVRAM is not used
	By terminal, parameters are saved in NVRAM, DIP switches are not used

Synchronization

S3-1, S3-2 switches set E1 channel synchronization mode:

S3-1	S3-2	E1 channel synchronization
		INT – internal oscillator
		RCV – from receiver
		DTE1 emulation (ETC)
		DTE2 emulation (ETC, ERC)

Transmit Clock Inversion

When INT or RCV synchronization mode is used, data signal TXD is delayed in relation to TXC clock. Summary delay is formed by cable delay and digital interfaces delay of modem and connected device. As a result of this delay errors can occur at some data rates. The problem can be solved by inverting the transmit clock signal using S3-6 switch:

S3-6	TXC inversion
	no TXC inversion
	TXC inversion

Receive Clock Inversion

When DTE2 emulation is used, the RXD signal is delayed in relation to ERC clock. Summary delay is formed by cable delay and digital interfaces delay of modem and connected device. As a result of this delay errors can occur at some data rates. The problem can be solved by ERC inversion via S3-7 switch.

When DTE2 emulation is not used, the S3-7 switch controls RXC inversion in relation to received data RXD:

S3-7	RXC or ERC inversion
	no RXC or ERC inversion
	RXC or ERC inversion

Use of Timeslot 16 / Scrambler

S3-3 switch controls use of E1 frame timeslot 16 in framed mode. In unframed mode S3-3 switch controls data scrambling.

S3-3	Framed mode: Timeslot 16	Unframed mode: Scrambler
	reserved for signaling	disabled
	enabled for data	enabled

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Unframed Mode Selection

S3-8 switch controls unframed mode selection. In this mode E1-L modem is compatible with Cronyx PCM2.

S3-8	Unframed mode
	is on
	is off

CTS Signal Control

CTS signal control mode is selected by S3-4 and S3-5 switches:

S3-4	S3-5	CTS mode
		CTS = 1
		CTS = CD
		CTS = RTS
		CTS = RTS*CD

Input Signal Gain

E1 channel receiver sensitivity can be set to -12 dB or –30 dB level. The S3-10 switch selects receiver sensitivity:

S3-10	receiver sensitivity
	normal (-12 dB)
	high (-30 dB)

Initial Timeslot

S1-1 ... S1-5 switches select the number of initial timeslot of E1 frame. They do not affect the modem operation in unframed mode.

S1-1...S1-5 - initial timeslot of E1 frame	
	timeslot 1 (one, not zero)
	timeslot 1
	timeslot 2
	timeslot 3
	timeslot 4
	timeslot 5
	timeslot 6
	timeslot 7
	timeslot 8
	timeslot 9
	timeslot 10
	timeslot 11
	timeslot 12
	timeslot 13
	timeslot 14
	timeslot 15
	timeslot 16
	timeslot 17
	timeslot 18
	timeslot 19
	timeslot 20
	timeslot 21
	timeslot 22
	timeslot 23
	timeslot 24
	timeslot 25
	timeslot 26
	timeslot 27
	timeslot 28
	timeslot 29
	timeslot 30
	timeslot 31

Number of Timeslots

S1-6 ... S1-10 switches select the number of timeslots used for data transmission. Data transfer rate depends on the number of timeslots selected and is equal N x 64

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kbps. In unframed mode the switches select only fixed data transfer rates: 2048, 1024, 512, 128, 64 kbps (marked with * in table).

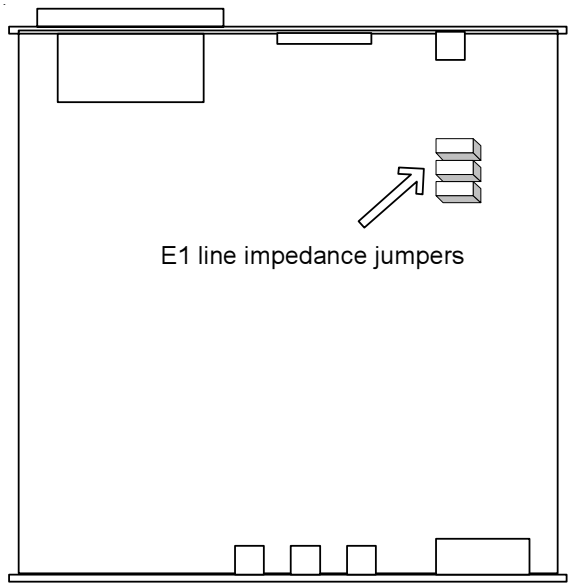
S1-6...S1-10	— number of TS — data rate	
	0 timeslots — 0 kbps	
	1 timeslot — 64 kbps	*
	2 timeslots — 128 kbps	*
	3 timeslots — 192 kbps	
	4 timeslots — 256 kbps	*
	5 timeslots — 320 kbps	
	6 timeslots — 384 kbps	
	7 timeslots — 448 kbps	
	8 timeslots — 512 kbps	*
	9 timeslots — 576 kbps	
	10 timeslots — 640 kbps	
	11 timeslots — 704 kbps	
	12 timeslots — 768 kbps	
	13 timeslots — 832 kbps	
	14 timeslots — 896 kbps	
	15 timeslots — 960 kbps	
	16 timeslots — 1024 kbps	*
	17 timeslots — 1088 kbps	
	18 timeslots — 1152 kbps	
	19 timeslots — 1216 kbps	
	20 timeslots — 1280 kbps	
	21 timeslots — 1344 kbps	
	22 timeslots — 1408 kbps	
	23 timeslots — 1472 kbps	
	24 timeslots — 1536 kbps	
	25 timeslots — 1600 kbps	
	26 timeslots — 1664 kbps	
	27 timeslots — 1728 kbps	
	28 timeslots — 1792 kbps	
	29 timeslots — 1856 kbps	
	30 timeslots — 1920 kbps	
	31 timeslots — 1984 kbps, 2048 kbps in unframed mode	*

Jumpers

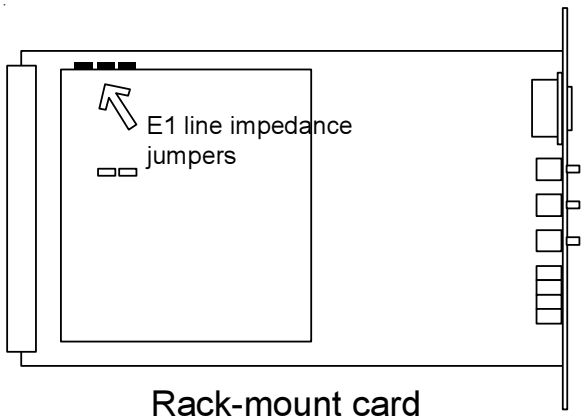
Jumpers location is shown in figure below. To set jumpers on a stand-alone device, the top cover should be open. The top cover is fixed with four screws protected by caps.

Line Impedance

E1 line impedance is set by three jumpers. Jumpers should be set for coaxial cable (75 Ohm) and should be removed for twisted pair. Modem is supplied in configuration for twisted pair line (120 Ohm).



Stand-alone unit



Rack-mount card

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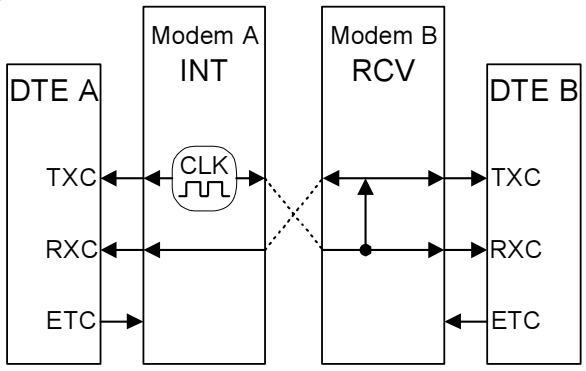
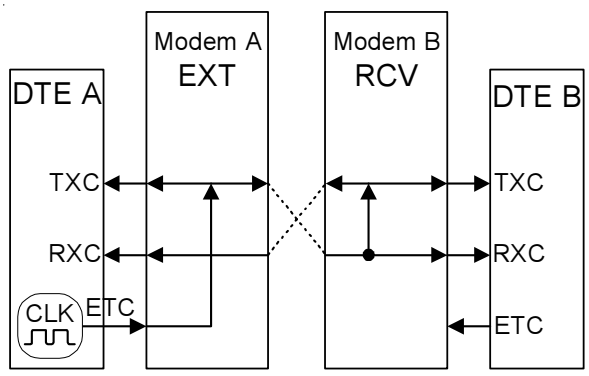
Clock Source Selection

Single Clock Source

For E1 channel, the single clock source is used as a rule. The source of clock signal may be an internal oscillator of any E1 modem or external clock signal of any DTE. Examples are shown in figures below.



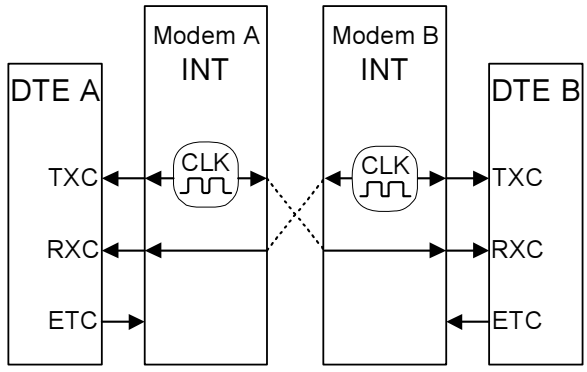
Single clock source from modem A



Single clock source from DTE A

Separate Clock Source

Receive and transmit lines of E1 channel are fully independent and they can have separate clock sources. Example of the mode is shown in figure on the next page.



Separate clock source
from modems A and B

X.21 interface

X.21 interface has ITU-T V.11 compliant specifications. Set of signals is different from other interfaces:

X.21 (DB-15)	Signal
2	Transmit (A)
9	Transmit (B)
4	Receive (A)
11	Receive (B)
7	ETC (A)
14	ETC (B)
6	Sig Timing (A)
13	Sig Timing (B)
3	Control (A)
10	Control (B)
5	Indication (A)
12	Indication (B)
1	Shield
8	GND

X.21 interface uses the single clock signal for received and transmitted data. For correct data receiving it is necessary to provide single clock source in channel. Two connected modems must have settings providing use of the same oscillator as a clock source, i.e. Int – RCV or EXT – RCV. Indication signal corresponds to CD signal and Control signal – to RTS signal.

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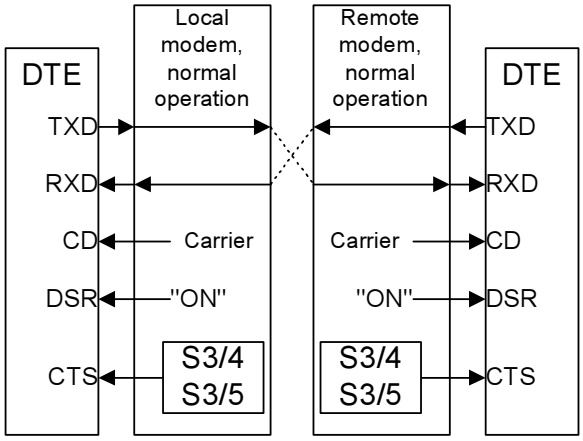
Loop Selection

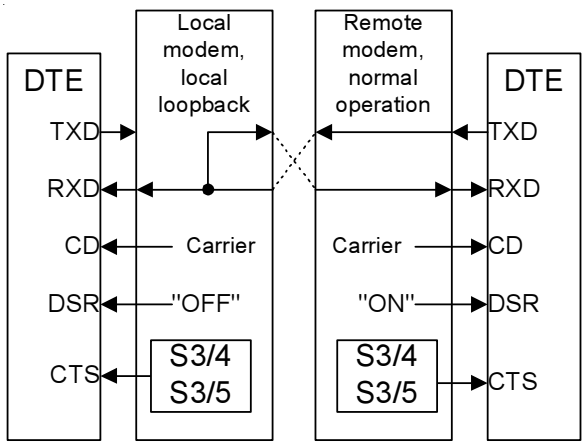
Normal Operation

LOOP1 switch is OFF.



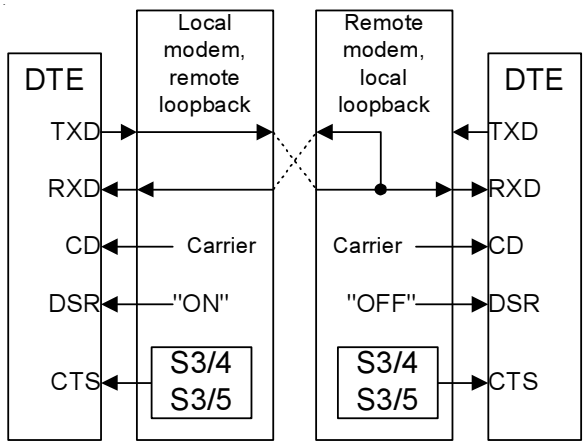
Local Loopback

LOOP1 switch is ON, LOOP2 switch is LOC.



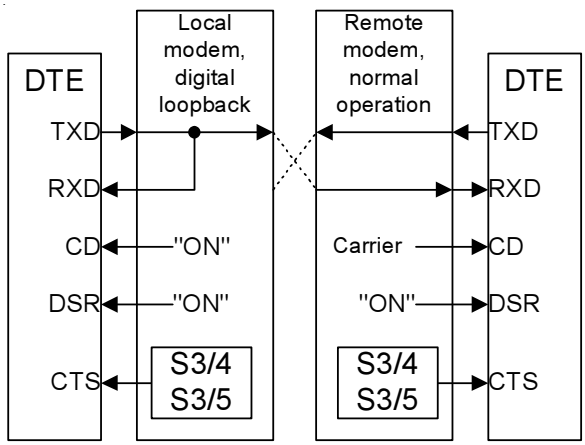
Remote Loopback

LOOP1 switch is ON, LOOP2 switch is REM. Remote modem turns on/off local loopback by local modem request.



Digital Loopback

LOOP1 switch is ON, LOOP2 switch is DIG.



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Alarm Interface

The modem is equipped with alarm interface. It provides turning on external alarm device (i.e. ring, buzzer, indicator) if some failure occurs: carrier loss, clock loss, power failure. Alarm device is turned on by "dry contacts" of relay. For rack-mount models the alarm interface is optional.

The alarm interface has also the input contacts. Their state (connected/disconnected) is transmitted to remote unit and turns on a relay. If modem is installed in unattended room, the alarm input contacts may be used, for example, for remote climatic sensors, door lock sensors, etc. Alarm input contacts work in framed mode only.

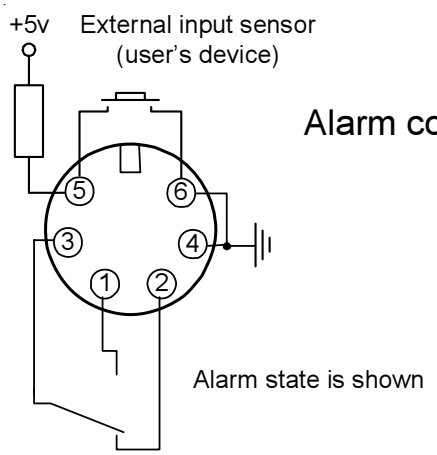
Warning! Input alarm contacts must be isolated from other electrical circuits. If this requirement is not carried out, modem may be damaged.

If power supply is ON and carrier is present contact 3 is connected to contact 1. If power is OFF or carrier is lost contact 3 is disconnected from contact 1 and connected to contact 2 ("alarm" state).

External input contacts have two modes: normal connected and normal disconnected. By default normal disconnected mode is set. If contact 4 is connected to contact 5 remote unit is set to alarm state.

Normal connected mode can be set through console. In this case input contacts should be connected by sensor. If input contacts are disconnected remote unit is set to "alarm" state.

Contact	Description
1	Shorted to common contact 3 on operating condition. Disconnected when error occurs.
2	Disconnected on operating condition. Shorted to common contact 3 when error occurs.
3	Common contact
4	GND
5	Input contact
6	GND



Alarm connector scheme

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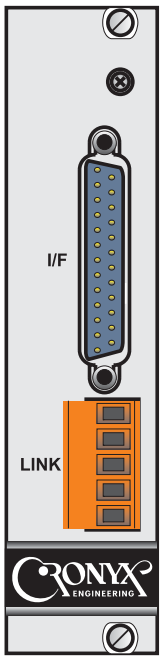
Rear Panel Connectors

There are digital interface connector and E1 line terminal block on the rear panel (see figures).

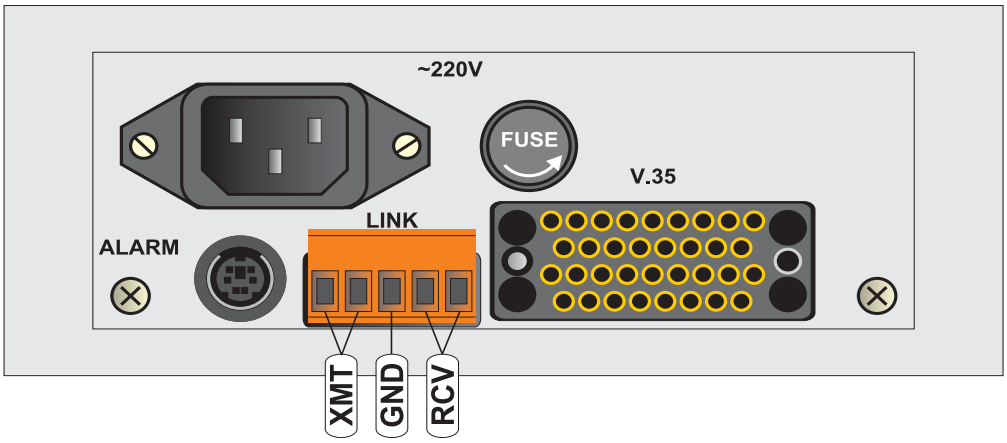
Modems with V.35 interface (model –V) have standard M-34 (female) connector:

Contact	Signal	Direction
P	TD-a	Input
S	TD-b	Input
R	RD-a	Ouput
T	RD-b	Ouput
U	ET-a	Input
W	ET-b	Input
Y	TC-a	Ouput
AA	TC-b	Ouput
BB	ERC-a	Input
Z	ERC-b	Input
V	RC-a	Ouput
X	RC-b	Ouput
C	RTS	Input
H	DTR	Input
E	DSR	Ouput
D	CTS	Ouput
F	DCD	Ouput
A	CGND	—
B	SGND	—



Models –232 and –530 have DB25 (female) connector for RS-232 and RS-530 interfaces:

Contact DB25	RS-530	RS-232	Direction
2	TXD-a	TXD	Вход
14	TXD-b	—	Вход
3	RXD-a	RXD	Выход
16	RXD-b	—	Выход
24	ETC-a	ETC	Вход
11	ETC-b	—	Вход
15	TXC-a	TXC	Выход
12	TXC-b	—	Выход
17	RXC-a	RXC	Выход
9	RXC-b	—	Выход
21	ERC-a	ERC	Вход
18	ERC-b		Вход
4	RTS-a	RTS	Вход
19	RTS-b	—	Вход
20	DTR-a	DTR	Вход
23	DTR-b	—	Вход
6	DSR-a	DSR	Выход
22	DSR-b	—	Выход
5	CTS-a	CTS	Выход
13	CTS-b	—	Выход
8	CD-a	CD	Выход
10	CD-b	—	Выход
1,7	GND	GND	—



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Model –X21 has DB15 (female) connector for X.21 interface:

DB-15 female	Signal	Direction
2	T(A)	Вход
9	T(B)	Вход
4	R(A)	Выход
11	R(B)	Выход
7	ETC(A)	Вход
14	ETC(B)	Вход
6	S(A)	Выход
13	S(B)	Выход
3	C(A)	Вход
10	C(B)	Вход
5	I(A)	Выход
12	I(B)	Выход
1, 8	GND, GND	—

Model –M has HDB44 (female) connector for multistandard interface:

Cont.	V.35	RS-530	RS-232	X.21
10	TXD-a	TXD-a	TXD	Transmit(A)
25	TXD-b	TXD-b	—	Transmit(B)
8	RXD-a	RXD-a	RXD	Receive(A)
9	RXD-b	RXD-b	—	Receive(B)
6	ETC-a	ETC-a	ETC	ETC(A)
7	ETC-b	ETC-b	—	ETC(B)
2	TXC-a	TXC-a	TXC	SigTiming(A)
3	TXC-b	TXC-b	—	SigTiming(B)
5	RXC-a	RXC-a	RXC	—
4	RXC-b	RXC-b	—	—
17	ERC-a	ERC-a	ERC	—
18	ERC-b	ERC-b	—	—
14	RTS	RTS-a	RTS	Control(A)
29	—	RTS-b	—	Control(B)
11	DTR	DTR-a	DTR	—
26	—	DTR-b	—	—
13	DSR	DSR-a	DSR	—
28	—	DSR-b	—	—
15	CTS	CTS-a	CTS	—
30	—	CTS-b	—	—
12	CD	CD-a	CD	Indication(A)
27	—	CD-b	—	Indication(B)
1,16	GND	GND	GND	GND
31	SEL-0*	SEL-0*	SEL-0*	SEL-0
33	SEL-1	SEL-1*	SEL-1	SEL-1*
35	SEL-2	SEL-2	SEL-2*	SEL-2
37	SEL-3	SEL-3*	SEL-3*	SEL-3*
39	SEL-4*	SEL-4	SEL-4	SEL-4
41	SEL-5*	SEL-5	SEL-5	SEL-5
43	SEL-6*	SEL-6	SEL-6	SEL-6
32	DCE	DCE	DCE	DCE

* - contact should be shorted to GND

Console

Modem front panel has DB9 connector for control terminal (console) with RS232 interface. Console can be used for monitoring of modem current state, channels state, statistics of local and remote errors. If remote management is enabled (S3-9 switch), user can set device mode through management console and store parameters in NVRAM.

Some parameters can be set only from management console:

- CRC4 framing;
- arbitrary timeslots selection;
- input alarm sensor mode;
- RXC inversion;
- compatibility mode.

Console connector has standard DTE wiring:

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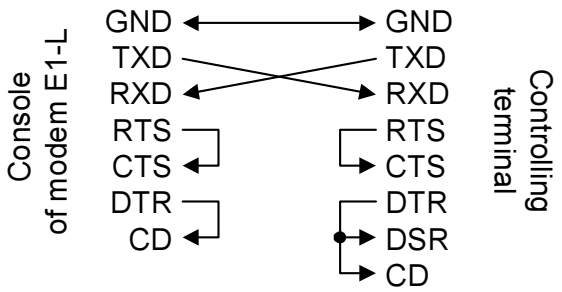
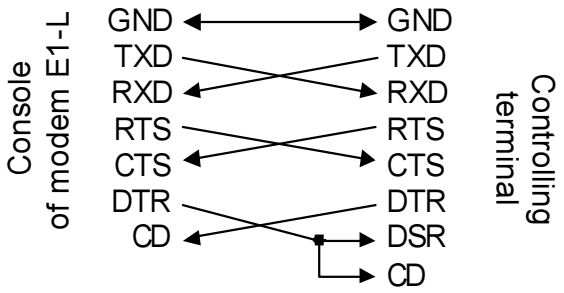
Contact	RS-232	Direction
3	TXD	Output
2	RXD	Input
7	RTS	Output
4	DTR	Output
8	CTS	Input
1	CD	Input
5	GND	—

It is necessary to provide signals CD and CTS for console operation. It is recommended to use following null-modem cable wiring:



Cable without modem control signals



Cable with modem control signals

Console user interface is implemented as a hierarchical menu. Main menu is shown in figure. To select a command user should enter its number.

User can set operation mode through menu «Configure». DIP switch S3-9 should be set in ON position.

```
Configure


  1. Main link...
  2. Serial port...
  4. Auto remote loopback: Enabled
  5. Save parameters
  6. Restore parameters

Command:
```

```
Cronyx-E1,  Revision B, 09/01/99

Jumpers: Tsync=Rcv, Rsync=Ext,,
         Ts0=0+16
Using jumpers settings.

Mode: Dumb
Main link: TP, Tsync=Rcv, Rsync=Ext, Low gain
Port: 1024 kbps - V.35, no DTR, no RTS, no ETC, no ERC, TXC, no RXC, CTS=1

             1 3 5 7 9 1 3 5 7 9 1 3 5 7 9 1
Timeslots 0: ################.................
Timeslots 1: .................################

  1. Configure...
  2. Statistics
  3. Loopback...
  4. Link test - stopped
  0. Reset

Command: _
```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Parameter settings can be saved in NVRAM by command «Save parameters». Previous parameters can be restored from NVRAM by command «Restore parameters».

To monitor current settings, channel modes, error counters, command «Statistics» should be used.

Counter	Error description
BPV	bipolar coding violations on the line
OOS	frame syncronization failed (number of seconds)
Slip	slip occured (number of seconds)
Err	external clock is failed or BER tester errors occured (number of seconds)

Modem transfers values of local error counters to remote unit and receives values of remote error counters via control channel. E1 channel state is identified by set of flags:

Flag	Channel state
Ok	Normal operation
LOS	Loss of line signal
AIS	Alarm indicator signal (blue code)
LOF	Loss of frame
LOMF	Loss of multiframe
FARLOF	Loss of frame on remote modem
AIS16	Timeslot 16 alarm indicator signal
FARLOMF	Loss of multiframe on remote modem
CRCE	Checksum error
RCRCE	Checksum error on remote modem

«Loopback» menu controls local, digital and remote loopbacks:

```
Loopback

1. Main link local loop - disabled
2. Main link remote loop - disabled
3. Digital port - disabled


Command: _
```

BER tester and loop management is available only if switches LOOP and BERT on front panel are OFF. BER tester and loop parameters settings are not stored in NVRAM.

«Main link» menu provides E1 line parameters setting:

```
Main link

  1. Framing: E1
  3. Transmit clock: Etc
  4. Timeslots...
  5. Timeslot 16: Use
  6. Crc4: No
  7. Receiver gain: Low

Command:
```

User can select timeslots for data transmission by moving cursor to corresponding position and pressing Spacebar. Symbol «#» marks selected timeslots.

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Cables Wiring

V.35 DCE cable wiring for –V models with external transmit clock (DTE1 emulation mode)

E1-L M34 (male)			DCE M34 (male)	
TXD-a	P	←	R	RXD-a
TXD-b	S	←	T	RXD-b
RXD-a	R	→	P	TXD-a
RXD-b	T	→	S	TXD-b
ETC-a	U	←	V	RXC-a
ETC-b	W	←	X	RXC-b
RXC-a	V	→	U	ETC-a
RXC-b	X	→	W	ETC-b
TXC-a	Y	Not connected		
TXC-b	AA	Not connected		
ERC-a	BB	Not connected		
ERC-b	Z	Not connected		
RTS	C	←	F	CD
DTR	H	←	E	DSR
DSR	E	→	H	DTR
CD	F	→	C	RTS
GND	A	↔	A	GND
GND	B	↔	B	GND

V.35 DCE cable wiring for –M models with external transmit clock (DTE1 emulation mode)

Signal	HDB44 (male)		M34 (male)	
TXD-a	10	←	R	RXD-a
TXD-b	21	←	T	RXD-b
RXD-a	8	→	P	TXD-a
RXD-b	9	→	S	TXD-b
ETC-a	6	←	V	RXC-a
ETC-b	7	←	X	RXC-b
RXC-a	5	→	U	ETC-a
RXC-b	4	→	W	ETC-b
RTS	14	←	F	CD
DTR	11	←	E	DSR
DSR	13	→	H	DTR
CD	12	→	C	RTS
TXC-a	2	Not connected		
TXC-b	3	Not connected		
ERC-a	17	Not connected		
ERC-b	18	Not connected		
GND	1	↔	A	GND
GND	16	↔	B	GND
SEL-x	31,39,41,43,32 connect to GND 1			

V.35 DCE cable wiring for –V models with external receive and transmit clocks (DTE2 emulation mode)

E1-L M34 (male)			DCE M34 (male)	
TXD-a	P	←	R	RXD-a
TXD-b	S	←	T	RXD-b
RXD-a	R	→	P	TXD-a
RXD-b	T	→	S	TXD-b
ETC-a	U	←	V	RXC-a
ETC-b	W	←	X	RXC-b
RXC-a	V	Not connected		

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RXC-b	X	Not connected		
TXC-a	Y	Not connected		
TXC-b	AA	Not connected		
ERC-a	BB	←	Y	TXC-a
ERC-b	Z	←	AA	TXC-b
RTS	C	←	F	CD
DTR	H	←	E	DSR
DSR	E	→	H	DTR
CD	F	→	C	RTS
GND	A	↔	A	GND
GND	B	↔	B	GND

V.35 DCE cable wiring for –M models with external receive and transmit clocks (DTE2 emulation mode)

Signal	HDB44 (male)		M34 (male)	
TXD-a	10	←	R	RXD-a
TXD-b	25	←	T	RXD-b
RXD-a	8	→	P	TXD-a
RXD-b	9	→	S	TXD-b
ETC-a	6	←	V	RXC-a
ETC-b	7	←	X	RXC-b
RXC-a	5	Not connected		
RXC-b	4	Not connected		
RTS	14	←	F	CD
DTR	11	←	E	DSR
DSR	13	→	H	DTR
CD	12	→	C	RTS
TXC-a	2	Not connected		
TXC-b	3	Not connected		
ERC-a	17	←	Y	TXC-a
ERC-b	18	←	AA	TXC-b
GND	1	↔	A	GND
GND	16	↔	B	GND
SEL-x	31,39,41,43,32			
	connect to GND 1			

V.35 cable wiring for –M models

Signal	HDB44 (male)		M34 (female)
TXD-a	10	←	P
TXD-b	25	←	S
RXD-a	8	→	R
RXD-b	9	→	T
ETC-a	6	←	U
ETC-b	7	←	W
TXC-a	2	→	Y
TXC-b	3	→	AA
RXC-a	5	→	V
RXC-b	4	→	X
ERC-a	17	←	BB
ERC-b	18	←	Z
RTS	14	←	C
DTR	11	←	H
DSR	13	→	E
CTS	15	→	D
CD	12	→	F
GND	1	↔	A
GND	16	↔	B
SEL-x	31,39,41,43		
	connect to GND 1		

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RS-232 cable wiring for –M models

Signal	HDB44 (male)		DB25 (female)
TXD	10	←	2
RXD	8	→	3
ETC	6	←	24
TXC	2	→	15
RXC	5	→	17
ERC	17	←	21
RTS	14	←	4
DTR	11	←	20
DSR	13	→	6
CTS	15	→	5
CD	12	→	8
GND	1	↔	1
GND	16	↔	7
SEL-x	31,35,37		
	connect to GND 1		

RS-530 cable wiring for –M models

Signal	HDB44 (male)		DB25 (female)
TXD-a	10	←	2
TXD-b	25	←	14
RXD-a	8	→	3
RXD-b	9	→	16
ETC-a	6	←	24
ETC-b	7	←	11
TXC-a	2	→	15
TXC-b	3	→	12
RXC-a	5	→	17
RXC-b	4	→	9
ERC-a	17	←	21
ERC-b	18	←	18
RTS-a	14	←	4
RTS-b	29	←	19
DTR-a	11	←	20
DTR-b	26	←	23
DSR-a	13	→	6
DSR-b	28	→	22
CTS-a	15	→	5
CTS-b	30	→	13
CD-a	12	→	8
CD-b	27	→	10
GND	1	↔	1
GND	16	↔	7
SEL-x	31,33,37		
	connect to GND 1		

RS-449 cable wiring for –M models

Signal	HDB44 (male)		DB37 (female)
TXD-a	10	←	4
TXD-b	25	←	22
RXD-a	8	→	6
RXD-b	9	→	24
ETC-a	6	←	17
ETC-b	7	←	35
TXC-a	2	→	5
TXC-b	3	→	23
RXC-a	5	→	8
RXC-b	4	→	26
ERC-a	17	←	3
ERC-b	18	←	21

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RTS-a	14	←	7
RTS-b	29	←	25
DTR-a	11	←	12
DTR-b	26	←	30
DSR-a	13	→	11
DSR-b	28	→	29
CTS-a	15	→	9
CTS-b	30	→	27
CD-a	12	→	13
CD-b	27	→	31
GND	1	↔	1
GND	16	↔	19
SEL-x	31,33,37		
	connect to GND 1		

Cable wiring for two devices connection (-M models)

Signal	HDB44 (male)		HDB44 (male)	Signal
TXD-a	10	←	8	RXD-a
TXD-b	25	←	9	RXD-b
RXD-a	8	→	10	TXD-a
RXD-b	9	→	25	TXD-b
ETC-a	6	←	5	RXC-a
ETC-b	7	←	4	RXC-b
RXC-a	5	→	6	ETC-a
RXC-b	4	→	7	ETC-b
RTS	14	←	12	CD
DTR	11	←	13	DSR
DSR	13	→	11	DTR
CD	12	→	14	RTS
TXC-a	2	Not connected		
TXC-b	3	Not connected		
ERC-a	17	Not connected		
ERC-b	18	Not connected		
GND	1	↔	1	GND
GND	16	↔	16	GND
SEL-x	31,39,41,43,32			
	connect to GND 1 on every connector			

X.21 cable wiring for –M models

Signal	HDB44 (male)		DB15 (female)
TXD-a	10	←	2
TXD-b	25	←	9
RXD-a	8	→	4
RXD-b	9	→	11
ETC-a	6	←	7
ETC-b	7	←	14
TXC-a	2	→	6
TXC-b	3	→	13
RTS-a	14	←	3
RTS-b	29	←	10
CD-a	12	→	5
CD-b	27	→	12
GND	1	↔	1
GND	16	↔	8
SEL-x	33,37		
	connect to GND 16		

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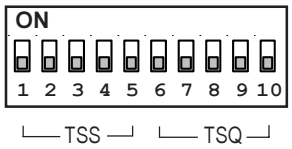
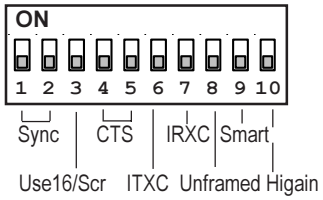
DIP switches



S1



S3

TSS ..... initial timeslot

TSQ ..... number of timeslots;
data transfer rate in unframed mode

Sync ..... E1 channel synchronization mode

Use16/Scr ..... use of timeslot 16;
data scrambling in unframed mode

CTS ..... CTS signal mode

ITXC ..... transmit clock inversion

IRXC ..... receive clock inversion

Unframed ..... unframed mode

Smart ..... parameters setting through terminal

Higain ..... high input gain

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